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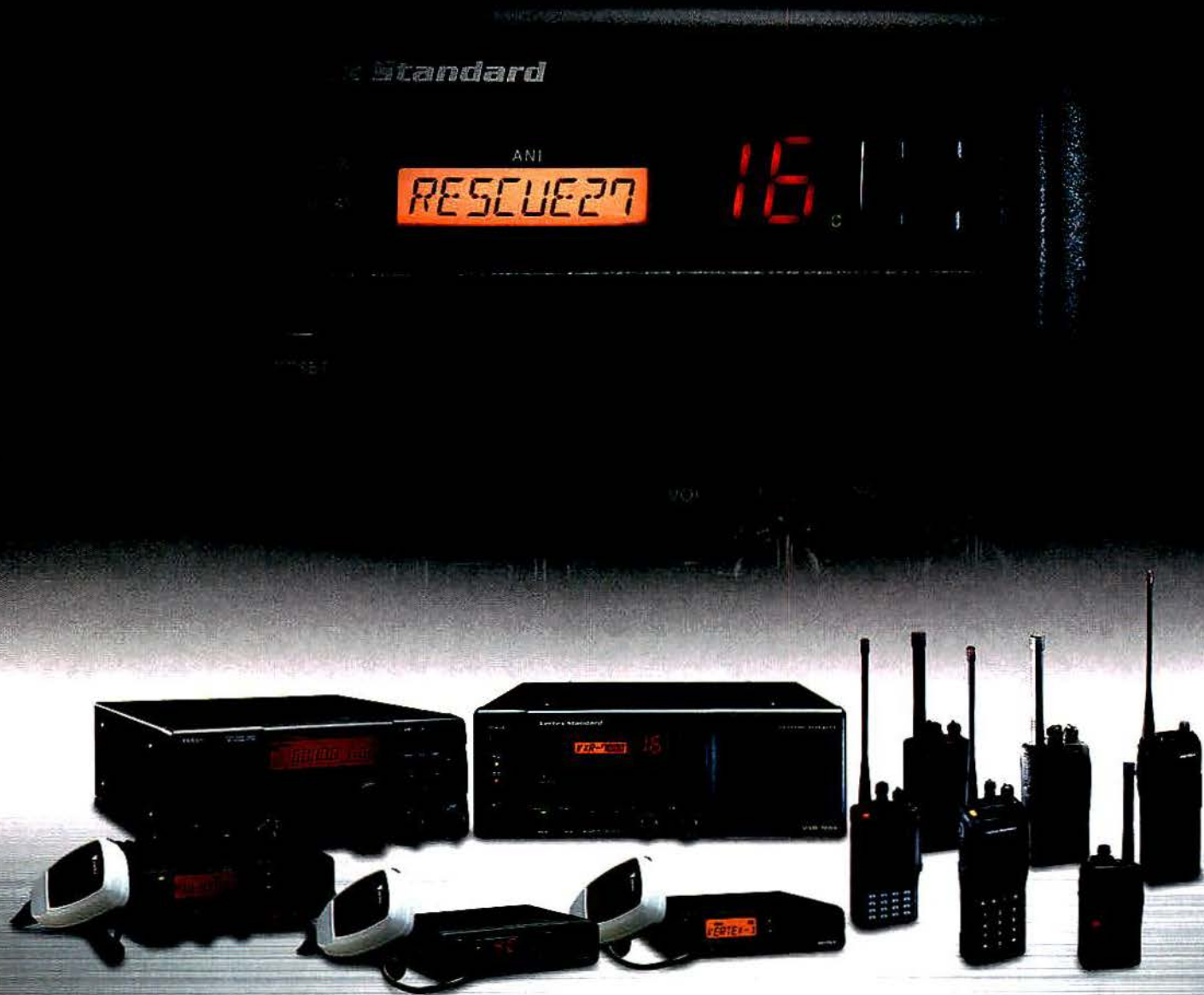
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JULY 2002
Volume 20, Issue 7

On the cover: The 2001 tornado in Cordell, OK, led to its selection as a location for interoperability tests. Photo courtesy of Cordell Beacon newspaper, Cordell, OK.

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Don Bishop
Boost LTR system revenue as much as 30% with PassPort trunking protocol. It shines the light on thievery among your competitors and—ahem—customers.
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Advertisers in this issue feature their latest land mobile products and services.

ON THE WEB AT WWW.MRTMAG.COM:



FCC extends 800MHz interference reply comment period to Aug. 7

Responding to a request by 17 organizations with something to say about how to resolve 800MHz interference to public safety communications, the FCC granted an extension to the reply comment period.



Narrowband mandate spurs \$18 million Nevada radio system

As part of a congressional mandate to reduce the bandwidth of the federal wireless radio channels, the National Nuclear Security Administration Nevada Operations Office spent \$18 million to replace and modernize its two-way radio and wireless data systems.

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Unlike LTR, the PassPort trunking protocol uses subscriber-unit electronic serial numbers so that system operators know exactly who is on their systems. See page 20.

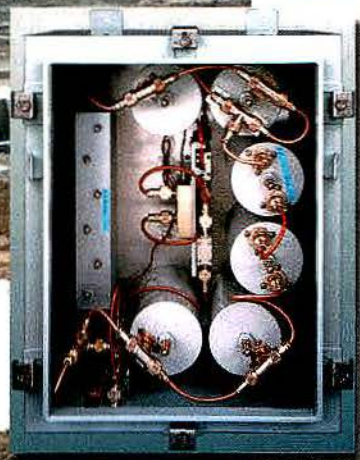
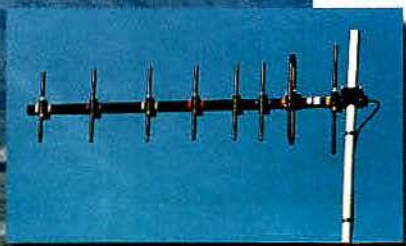
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CIRCLE (5) ON FAST FACT CARD

Portable radios need towers—*imagine that*

When it comes to two-way radio equipment, portability rules.

With business and industrial customers, sometimes the first wireless phones or radios they think of are cellphones and Nextel phone-radios. One advantage they offer a manager is the ability to call workers anywhere when they wear portable phones or radios on their belts.

But utility crews, towing service drivers and delivery workers spend more time in their vehicles. Their managers like two-way radios mounted in the trucks, out of harm's way, where they can't "walk off." Mobile units have less damage and loss and need less maintenance than portables, which, sooner or later, go flying off the belt to the pavement. And mobile units need no replacement batteries.

For technical reasons, a mobile antenna on a vehicle works better than an antenna on a cellphone or a portable radio. Also, the mobile radio usually has higher power. And vehicles are more likely to be positioned outside where signals exchanged with antenna towers aren't weakened by passing through walls to reach building interiors. Because all things are *not* equal, mobile units communicate better and require fewer antenna towers in the area to make them work. Together, those factors cut capital expenditure and maintenance expense for mobile radios.

Why, then, does portability rule?

For business and industrial users: *convenience* and *efficiency*. For public safety agencies: *operational demands* and *protection*.

For example, as commercial portable prices have fallen, customers who previously wouldn't

have equipped hotel, motel and warehouse workers with them are finding them desirable and cost-effective to use, leading to more sales opportunities for dealers. And the pricier belt-worn por-



tables used by public safety workers serve their need to exit vehicles quickly to enter buildings or engage in footchases.

One manufacturer specializing in portable radios said it is more difficult to make portables than mobiles. "We're always keeping an eye on the amount of current required to run the microchips a radio needs these days. Packing circuitry into a small box and making it work well means you've distinguished yourself to certain extent. Compared to the same functionality in a 12V mobile with more room in the case for shielding and cans, making a portable is a greater challenge," the company's marketing manager said.

Some manufacturers simply couldn't meet the challenge of making a portable that was compact enough and competitively priced (or couldn't meet it soon enough). Securicor Wireless and ComSpace come to mind.

Twenty years ago, as much as 80% of radio terminal sales were mobiles. Today, an estimated 60% of radio terminal sales are portables.

The *trend* is clear, but sometimes the *signals* aren't. On June 22, the police chief in Greenwood, IN, south of Indianapolis, withdrew his department from a new, county-wide 800MHz digital radio system after six months of use. He had the city's previous analog system turned back on and returned to service the portable analog radios that his officers previously used.

The 800MHz system's towers seem to be too far away to reach the new portables reliably. The nearest is about 12 miles away. The police department's VHF highband analog system's relatively short tower is right behind police headquarters, giving good coverage to Greenwood but not far beyond. The chief said he was willing to give the 800MHz system another try, but not until the coverage is fixed.

Businesses find two-way radio portability advantageous, and public safety agencies find portability essential. Their requirements are slightly different, which leads to different products and prices.

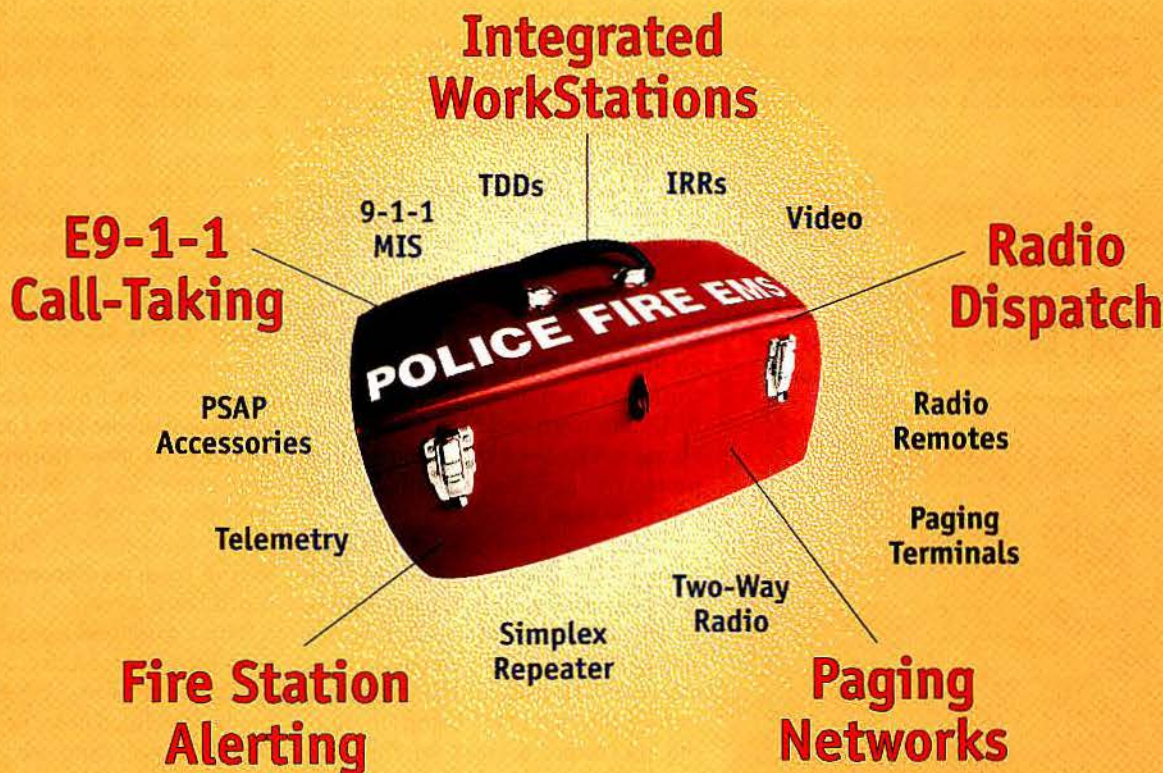
Don't be reluctant to deploy portable radio communications. Just be sure the system you use has antenna towers near enough to reach the portables where the people using them are likely to go.

Don Bishop

Editorial Director

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CIRCLE (6) ON FAST FACT CARD

Taking care of the babies

By Robert H. Schwaninger Jr.

During the past few months, the radio communications industry has witnessed another episode of the long-running saga *What's Wrong At 800*, starring Nextel as the scheming patriarch; local operators as the lovable, but sometimes ineffective sidekick; utilities as the whispering siren that seems to be on all sides at once; and the FCC as the cantankerous dowager, who just

again and again?

The objective observer might conclude that, indeed, we have been feeding this fragile child the wrong stuff. Because of it, we have created the thing that wails in the night, screaming not always for more spectrum-food, but for the right nutrition in the form of spectrum set aside for public safety's own use, misuse, interoperability, Project 25-through-a-zillion, homeland temerity and more.

Public safety's newest complaint is that its 800MHz systems are bombarded with interference from cellular radio systems (and Nextel) that use a low-site system architecture that desensitizes cops' radios. In fact, all 800MHz analog operators suffer the same problem or threat. But the FCC didn't respond to the rest of the operators. Instead, the grandma-like protective urge didn't hit the agency until the baby cried.

After all interested parties checked the crib to make sure that the poor thing didn't need emergency care, most of the family decided that the baby needed its own nursery, its own bottle, its own nanny, its own everything (including, perhaps, a swat on the bottom). The swat is for hinting that it didn't just need a little care. The price of shutting up might include some additional spectrum as part of the pacifier.

After checking its general health, most interested parties concluded that public safety would be better served by creating an incubator for all future safety services at 700MHz, adding to public safety's already considerable presence in that band and creating contiguous swaths of spectrum across former UHF-TV channels 52-59 to go along with public safety's allocation at UHF-TV channels 60-69. This would remove public safety from the 800MHz band and allow the commercial and industrial operators to reach their own treaty, without

needing to tip-toe around the baby.

Despite this wholly logical idea, some resist the notion. First, broadcasters that remain in this band don't expect to migrate to their new DTV digs until every man, woman, child and buck-toothed lemur owns an HDTV set, *unless* they are paid a hefty sum from whoever buys the spectrum in a scheduled auction. The FCC would like these broadcasters to be reasonable. It won't happen.

Broadcasters are the politicians' other favorite child. As is public safety, the broadcasters are coddled and fed and praised incessantly for convincing us that their willingness to air *The Osbournes*, *Smackdown*, *Access Hollywood* and *Fear Factor* is a noble endeavor. This titanic toddler throws more tantrums than any other, and Grandma FCC, with the urging of Grandpa Congress, dotes upon it while others shrink from its discomfiting infantile outbursts.

What would be logical and fair is to let the broadcast baby have its spectrum until 2006, the already scheduled date for the move to DTV spectrum, while public safety gears up to move its myriad uses into the band. Because public safety requires at least 14 meetings and 85 regional seminars to do anything, plus a host of funding initiatives, council meetings, board meetings, public hearings, working groups, and numerous bureaucratic efforts, the 2006 date should be just right.

And although moving public safety into the hopefully soon-to-be unoccupied crib of the broadcasters makes a lot of sense (this hand-me-down is a beaut), the public safety operators aren't sure they want to move there, and the broadcasters don't want them there. Why, you may ask, won't the babies stop crying?

Public safety wants to make



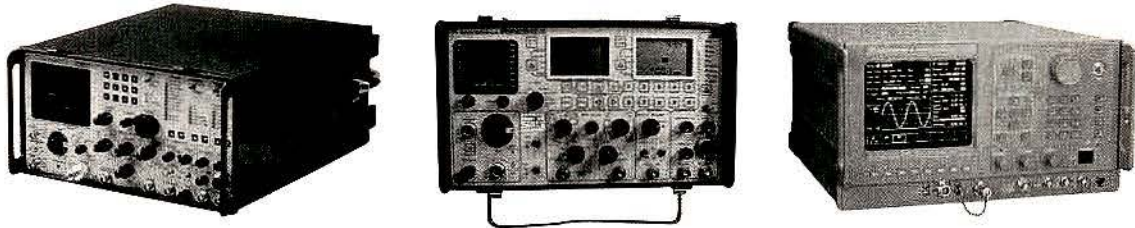
Illustration by John Hayes

wants everyone to get along with the howling baby: public safety.

Our story is all about public safety and how this child can manage to survive and thrive with more spectrum than all other private radio users combined. Did we overfeed it? Or, more accurately, did we feed it the wrong thing—

Schwaninger, MRT's regulatory consultant, is the principal in the law firm of Schwaninger & Associates, Washington, which is counsel to Small Business in Telecommunications. Schwaninger is also a fellow of the Radio Club of America. His email address is rschwaninger@sa-lawyers.net.

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CIRCLE (7) ON FAST FACT CARD

sure that if it moves, someone else will pick up the more than a billion bucks in hard costs to make the move. It doesn't care who pays, as long as it's somebody other than local governments. And because few entities are willing or able to pick up the tab, the flight to 700 looks like a pay-as-you-go problem for public safety.

The broadcasters don't fear much, but they are aware that if their ability to fleece the public by continued occupation of UHF-TV channels 52-59 in the form of free spectrum rent is ever to be disturbed, the one group that could cause early (or timely) eviction is public safety. And if broadcasters are tossed, no auction winner may line their pockets to get them to stop squatting on the channels.

Meanwhile, as in all good dramas, another character looms on the edges of our story in the form of the federal government. The feds will soon announce an initiative to mandate interoperability among federal, state and local public safety operators—to coordinate the war on terrorism and to be more responsive for disaster relief. The logical and perhaps only spectrum available for making interoperability a reality is at 700MHz.

So, the drama at 800 extends quickly and appropriately into the 700MHz band, where reluctant and sometimes recalcitrant factions have entrenched their respective positions of non-cooperation. The solution to the problem required an inventive and committed FCC to delay the scheduled auction of the 700MHz channels, tell public safety that they can have the bands for relocating out of 800MHz, and tell the broadcasters to pipe down and begin packing for new spectrum digs.

The FCC demonstrated the political will to truly manage the spectrum and delayed the auction until Jan. 14, 2003. The FCC resisted the shrill demands of the incumbent UHF-TV broadcasters and showed itself worthy of the moniker "expert, independent agency."

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CIRCLE (26) ON FAST FACT CARD

What it means to get along

It really is more than just talk.

By David O. Dunford

"A change is as good as a rest," Ron Phillips used to say, according to his daughter, Ann, who now directs the family business—a radio common carrier based in Kansas City, MO.

If that chestnut of wisdom from Mr. Phillips is correct, we will be in for the equivalent of an extended vacation based on coming changes in public safety communications. One big change should involve how we work together.

The word "interoperability" (it really *was* a word before Motorola invented it) is rearing its ugly head again. Otherwise reasonable folks who appear to be too tightly wrapped in the cloak of "9-11" have begun to espouse opinions about it, and they are attempting to impose their views on others, all in the name of public safety. But it's important to not confuse interoperability with "intertalkability." Interoperability involves all the aspects of working together, whereas intertalkability is simply

talking on the radio to each other. We want the former but often confuse it with the latter.

The process of Integrated Emergency Management provides a structured mechanism for multiple responding agencies to work together to handle an emergency situation. The main tool for this management process (and related communication task) is the Incident Command System.

ICS is a prescribed set of rules or procedures by which an incident of any scalable size can be managed. Because ICS already anticipates multiple-agency mutual aid response with disparate communications systems, intertalkability is only one small part of it. ICS is a reality, and its result mirrors the concept of interoperability. What's important is responders *working* together, not just *talking* with each other.

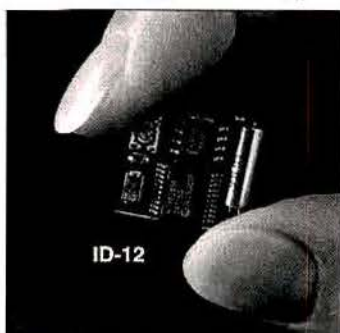
Obviously, firefighters, paramedics and cops need to interact in dealing with an emergency response. As

part of that process they should be able to talk on the radio among their individual work groups. But as the scope and intensity (and congestion and work density) of the incident ratchets up, the need for wide-area, high-tech, network-affiliated intertalkable radio declines. When a group of rescuers is assigned to dig a single residence, or when a tactical team is conducting operations at a single school, requirements for "network availability," "communications infrastructure resources" and "wide-area coverage" all go out the window.

Well-meaning public officials, well-intended citizen advisors, and not-necessarily-so-selfless commercial providers may sense an urgency for a large scale overhaul of public safety radio communications, all intended to help what they call interoperability. No doubt that the resulting intertalkability could be helpful, but certain, currently publicized problems between several of the federal "alphabet police" agencies wouldn't be solved by simply talking (or not) to each other on two-way radios.

Public safety communications is simply one tool to enhance public safety. The important benefit of any joint response is the understanding of the individual roles that each responder brings to the scene—not the conversations they have on their radios. Better understanding and more universal acceptance of the Incident Command System would vastly improve joint responses, but the training and preparation (and acceptance) must come before the incident, not on the two-way radio while enroute to the call. ■

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CIRCLE (10) ON FAST FACT CARD

From tornadoes to terror

The winds of change are pushing for first-responder connectivity. The feds are looking to spend millions to make it happen.

By Don Bishop

When Fire Chief Tom Merrill looked out at Cordell, OK, after a Force Three tornado swept the city on Oct. 9, 2001, he couldn't tell at first how many people may have been killed or injured. What he *could* see was massive destruction in the city of 2,867, located 84 miles east of Oklahoma City.

The fire chief knew that help would be forthcoming from neighboring jurisdictions, even as he mobilized his three full-time and 12 volunteer firefighters for the nucleus of the city's disaster response. The fire department would have overall operational command of the incident.

The tornado came and went quickly. Within five minutes of the funnel lifting from the city, the fire chief found the cellphone service overloaded and blocked. In the following minutes and hours, the city's emergency call center received hundreds of calls in a period when far fewer would be normal.

As calls from the public were sorted out, and as word came back from responders in the field, the good news was that the tornado had taken no lives, and only six people were injured. But an estimated 150 of the city's 1,487 dwellings were destroyed or uninhabitable.

"More than 35 fire departments,

250 firefighters, the Oklahoma Highway Patrol, various county sheriff offices, the Oklahoma National Guard and armies of utility and service units answered the call for assistance. We had some difficulty communicating with them by radio," Merrill said.

The episode led to Cordell's selection as a simulated disaster exercise location to demonstrate equipment for radio interoperability. The exercise did not

Bishop is editorial director. His email address is dbishop@primediabusiness.com. Photo credits: EADS Telecom North America (above) and Cordell Beacon newspaper, Cordell, OK (above right).



Tetrapol edges in through disaster exercise

The simulated disaster exercise in Cordell, OK, gave Dallas-based EADS Telecom North America an opportunity to demonstrate its Tetrapol trunked radio product, Connexity. The frequency-division, multiple-access (FDMA) product works on 12.5kHz-wide channels in the frequency range of 380MHz to 512MHz.

Tetrapol handsets were given to Oklahoma Governor Tom Keating and other observers to use as "pretend" incident commanders for a first-hand experience using the interoperable communications. The Tetrapol handsets used UHF frequencies licensed to the National Guard.

With its present frequency limitation, Connexity fits best with U.S. military and some motor transport applications. But Ralf Borgardt, director of U.S. sales at EADS Telecom, acknowledged that U.S. public safety radio communications is

moving toward 800MHz.

"We will adapt our product for 800MHz. In fact, the Project 25 Phase II standard is the EADS two-slot TDMA design that fits Connexity with the required backward compatibility with Project 25 Phase I," Borgardt said.

"Meanwhile, we are addressing the markets we can. For example, some motor transport companies have UHF frequencies. They have no special need for Project 25 compatibility, and they need the data capability that Tetrapol offers," Borgardt said.

In October 2001, EADS Telecom partners Science Applications International and Raytheon won a \$17 million contract to supply Tetrapol equipment to the U.S. Army, representing EADS Telecom's—and Tetrapol's—entry into the North America market.

provide training for emergency response organizations.

Lexington, MA-based Raytheon demonstrated how its First Responders Command and Communications Vehicle integrates voice and data communications carried over satellite telephones, wireless local area networks and two-way radio networks with incident command software. At the core of the FRCCV is a JPS Communications ACU-1000 cross-connect gateway, which interconnects otherwise incompatible radios by using their over-the-air signals.

The company built the FRCCV after reviewing the technologies it had already provided to the U.S. Department of Defense and how to use them to support the nation's needs in response to the Sept. 11 terrorist attacks.

"But we wanted to show that the system is designed for more than a terrorist incident," said Dale Craig. Craig is Raytheon's site manager and capture leader for the FRCCV in the Command, Control,

Communications and Information Division (known as C3I) at the company's Garland, TX, facility.

The technologies:

Satellite links — "What we designed brings in two satellite links, including an Inmarsat terminal and a Globalstar system. They give the incident commander telephone service to replace the cellular that so often is overloaded during a disaster," Craig said.

Inmarsat delivers a 64kbps uplink and downlink, but the vehicle must be stationary to use it. The Globalstar satellite phone works on the move. It provides voice communications and 9.6kbps data service.

Internet access — The vehicle has a Verizon cellular capability with as much as 120kbps of data linkage for using the Internet to receive information that the incident commander may want.

Two-way radio — "The ACU-1000 allows almost any type of radio

systems to be linked together without changing existing radios. It can configure them into talk groups to manage, command and control various resources," Craig said.

Wireless LANs — The FRCCV uses as many as three wireless LANs to connect with emergency operations centers at the scene. The wireless LANs can move video from a camera in wireless mode to the vehicle. That video can be linked by Inmarsat to share information with other agencies.

Incident management software — Software on the system allows the incident commander to manage

(Above left) Raytheon's First Responders Command and Communications Vehicle makes various agencies' radios interoperable at the March 7, 2002, simulated train derailment and release of hazardous materials in Cordell, OK. (Above right) A dwelling demolished by the Force Three tornado that struck Cordell on Oct. 9, 2001.

resources on the scene and make decisions based on the commander's concept of operation. Craig said that a Dallas fire chief had recommended FieldSoft software from the Chandler, AZ-based company with the same name as its product. Raytheon sent represen-

tatives to Phoenix to review it, and they chose it for the FRCCV.

President George W. Bush's proposed budget includes \$3.5 billion for equipping first responders. Raytheon saw an opportunity to adapt its military technology for police and fire departments eligible

for grants that should follow from the Federal Emergency Management Agency.

For a price ranging from \$100,000 to \$250,000, a public safety agency can deploy the mobile interoperability system in a Chevrolet Suburban sport utility vehicle that can do some of the most important work of a network-based interoperable system worth millions of dollars.

"We think we are competitive, and that price seems to resonate with the fire battalion chiefs and some of the police commanders," Craig said. "We're not trying to sell radios; we're providing a vehicle. For example, it gives a battalion fire chief the day-to-day capability to do his job, and when he has to scale up, it can do that. We also see a market with county sheriffs. They have a wide area to cover, often crossing city jurisdictional lines and involving different radios and frequencies with a need to link them."

Simulating and communicating

In Cordell, the various mutual aid teams used the simulated disaster exercise to test their ability to respond to a derailment of a train carrying hazardous goods within city limits. The exercise drew responders from the Oklahoma National guard and police, fire and emergency medical services.

Meanwhile, the fire chief who provided incident command during last year's tornado emergency and who used the vehicle during the disaster simulation said that the vehicle's usefulness was evident.

"The vehicle is much too complicated for someone to comprehend its total capability during one such exercise, however its benefit was readily apparent. The vehicle would have been helpful during the Oct. 9, 2001, incident. The simulated disaster exercise featured several situations that involved organizations not normally used to communicating with each other. The vehicle made radio traffic routine between various frequencies and departments," Merrill said. ■

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The airtime operator's *Glass Slipper*

Finding the perfect FB8 fit.

By Don Bishop

FB8 is not a personalized license plate for you to decipher.

FB8 is a designation that comes with an FCC license stating that the licensed radio facility has a *protected service area*. That's important because a trunked system with a protected service area can handle the most users—giving the operator more revenue for a given infrastructure cost.

Trunking means automatic channel selection from a pool of licensed channels. Channel selection can be controlled by software in the subscriber units (*decentralized trunking*) or by a repeater-based controller (*centralized trunking*).

Protection means that when FCC-certified frequency advisory committees (frequency coordinators) see the FB8 designation for a given frequency and location in their databases, they won't forward any applications to the FCC to use the same frequency nearby in a way that would interfere.

On frequencies below 470MHz, most business and industrial two-way radio users *share* the frequencies with other users. Each user must monitor the frequency before transmitting and wait if the fre-

quency is busy.

With decentralized trunking, the subscriber units send data to one another to identify an open channel and to gather the units in their working group on that channel. The subscriber units scan and monitor the trunked channels, any one of which might be occupied by users foreign to their airtime radio system, reducing the system's capacity.

With centralized trunking, the protected control channel is always accessible for channel assignments. If one or more of the other trunked channels are FB8, too, it just gets better—no electronic monitoring is necessary and system capacity can reach a maximum.

OK, how do you get these valuable FB8s?

It takes computer-assisted frequency searches, some engineering, an application blessed by a frequency coordinator and a license grant from the FCC.

Frequency coordinators can find which frequencies qualify as FB8 based on site location, transmitter power and antenna height, among the most important system characteristics.

Engineering companies offer similar services. A license applicant with specific frequencies in mind might work with an engineering company to see how a system could be configured with site location, transmitter power, antenna height,

How ITA finds 450MHz FB8s

Frequency-by-frequency, in the entire 450MHz band, the Industrial Telecommunications Association's software downloads all incumbents within a 100-mile radius and calculates the 39dbu service and 21dbu interference contours for the proposed and incumbent sites.

For F1 (first frequency), the software looks for a negative overlap of the proposed site's interference contour with the incumbent sites' service contours, and the incumbent sites' interference contour with the proposed site's service contour. Negative overlap is a "pass."

If the analysis of the first or a subsequent incumbent on F1 is positive (a "fail"), analysis of F1 stops—there is no reason to analyze other incumbents. The analysis moves to F2, and so on. Once all frequencies in the band are analyzed, the system lists all "passing" and "failing" frequencies, based on contour overlap.

If no FB8s are found with a given transmitter power and antenna height, another analysis with reductions may succeed. Even if only a limited service area can be fit, it can be a good strategy to apply for it. That prevents any other facilities that would conflict from being licensed.

Then, you can ask for letters of consent from incumbents or see about changing the frequency to increase the coverage. But until you have your FB8, there is no limit on the number of shared users that may be added to the frequency.

—Andre F. Cote
Senior Vice President
Industrial Telecommunications
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Bishop is editorial director. His email address is dbishop@primediabusiness.com.

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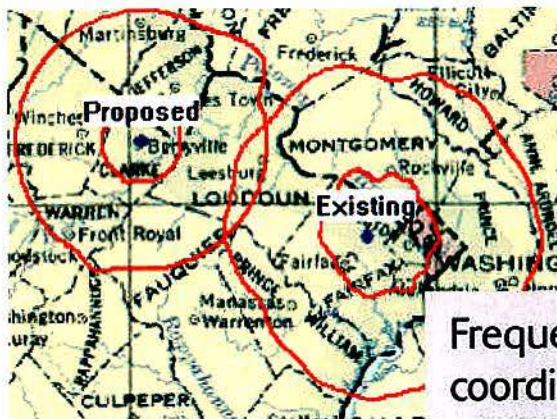
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Inner circles are service contours; outer circles are interference contours. With no overlap of either service contour with either interference contour, the proposed site has no conflict with the existing site—first step toward licensing a valuable FB8. *Image courtesy of SiteSafe (RFCAD).*

antenna directionality and channel bandwidth to make a given frequency work in a given area. Applicants for narrowband channels have a better chance of obtaining FB8s because the frequency coordinator has to check fewer adjacent channels than when coordinating wideband systems.

Want to do it yourself? Some engineering companies make Web-based software tools available on a subscription basis.

With enough FB8s in enough locations, an airtime system operator can cover a wide area. Then, with the use of a networking protocol, such as PassPort (Trident Micro Systems), LTR-Net (E. F. Johnson) or ESAS (Relm Wireless), you can link the sites together.

Linked sites allow dispatch customers to communicate over wide areas, typically for much less cost than dispatch service offered by Nextel Communications. It makes independent airtime system operators highly competitive with the big boys.

Although it's virtually impossible to obtain new FB8s in metropolitan areas with reasonable coverage areas, the farther from population centers, the more likely they are available. The trick is to find FB8s where enough population can be covered for a successful business.

Resourceful airtime system operators can draw upon the services of frequency coordinators and engineering companies to help them find those valuable FB8s. ■

Frequency coordinators

An up-to-date list of frequency coordinators can be found on the FCC Web site at <http://wireless.fcc.gov/plmrs/coord.html>.

Frequency coordinators that maintain their own databases of current FCC licenses and pending applications include ITA, PCIA and APCO. Some coordinators subcontract with ITA for coordination services, including database access. Others use one of two independent database providers.

Engineering companies

Engineering companies that maintain their own databases include RadioSoft and SiteSafe.

"Our customers include some frequency coordinators that use our database and software tools on a daily basis to support their coordination work and to file applications directly with the FCC. A second group includes manufacturers and consultants who use the engineering tools available on our SpectrumWatch.com Web site to look up license information and to run studies to choose the best frequency for various applications," said SiteSafe's chief information officer, Winston Smith.

Peter Nordby, SiteSafe's data services manager, added that the world in SiteSafe operates has two business models:

- coordinators that maintain their own databases and engineering tools. "A customer signs up for the package deal. You pay for the engineering services and have to file applications through them," he said.
- other coordinators that use independent data providers, such as SpectrumWatch.com or RadioSoft's software packages.

"Our model is to provide basic engineering services that anyone can subscribe to. Customers do their own research and choose their coordinator. We support their engineering, and then load in the results for the coordinator. Then, as we generally are the database provider for that coordinator, we transmit the application directly to the FCC," Nordby said.

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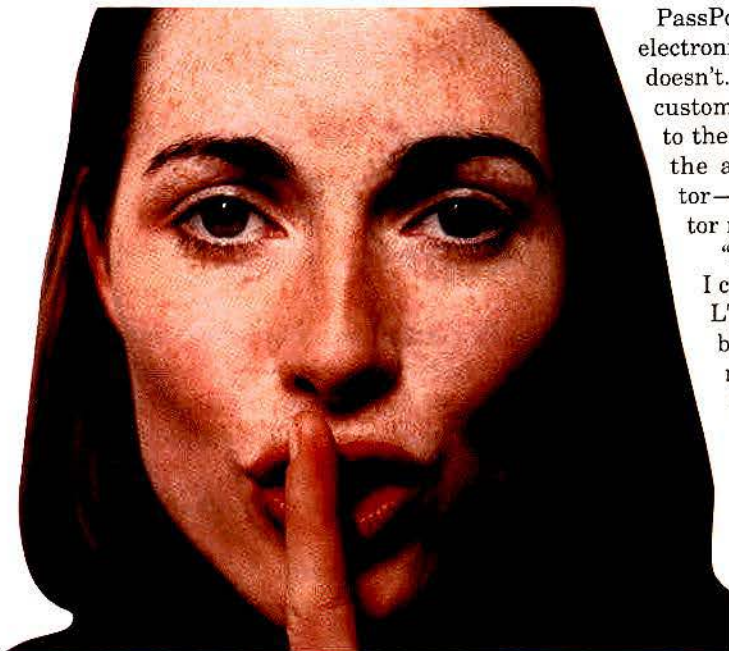
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CIRCLE (15) ON FAST FACT CARD

PassPort exposes *dirty* secret

Ssssh...don't tell anyone,
but there are more LTR units than I told them.



By Don Bishop

One thing about PassPort trunking protocol: It exposes—and overcomes—the dirty little secret among “good” dealers, “bad” dealers and their customers involving LTR systems.

LTR is a widely used analog trunking protocol that works with single sites. PassPort is a widely used digital trunking protocol that can be added to existing LTR systems to allow multiple sites to be networked.

PassPort uses subscriber-unit electronic serial numbers; LTR doesn't. LTR's deficiency allows customers to add LTR radios to their fleets without telling the airtime system operator—and the system operator may never know.

“I always jokingly said I could tell you how many LTR mobiles we were billing for, but not how many were on the system,” one dealer said, on condition that he not be identified.

For example, one customer had bought 20 LTR units from the dealer. But when the dealer converted the customer to PassPort, the customer regis-

tered 34 units. The customer's explanation? “Oh, I guess we've been buying a few units, here and there.”

Some dealers with, let's say, a “deficient conscience,” sell LTR subscriber units for use on someone else's system, whispering to a similarly conscience-challenged customer: “You don't have to tell Joe at Gullible Communications that you have these units. He'll never know.”

Our dealer said, “If we ever charge an LTR customer for *one more* radio than they think they

have, they call and raise Cain. But if we charge for *fewer* than they have because they bought some elsewhere, the customer thinks, ‘too bad’—it's our problem. That's theft of telecommunications service, just like stealing cable TV or telephone service. We know it goes on, but it's difficult to prove.”

Unscrupulous dealers happily sell radios to someone else's airtime customer, helping the customer to avoid monthly subscriber unit airtime charges. In fact, the “bad” dealer can *charge a little more* for the radio because the stolen airtime more than offsets the “premium.”

“Stolen airtime is, and always was, a problem with LTR. LTR never was the *best* protocol; it was only the *most common*. PassPort is stopping all of that thievery,” the dealer said.

Two other dealers said that as they convert LTR to PassPort, all subscriber units have to be registered by electronic serial number. They expect an eventual revenue increase of 30%—all from billing for previously stolen airtime. It's enough, one dealer said, to pay for the PassPort installation.

The dealers spoke about PassPort, but asked for anonymity.

Bishop is editorial director. His email address is dbishop@primediabusiness.com.



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Much of what they said was complimentary, but to elicit words about any minor problems required secrecy.

What problems?

"Everybody has software problems," the first dealer said. "It's been a nightmare. Also, we have been through numerous iterations

of firmware from Trident and Kenwood. We've tried lots of different radio manufacturers, and all seem to have some hiccup.

"We've been in the trunking world for so long, when you connect A to B and C to D, and you tune it to manufacturer's recommended specs, and when the RF works, there's not much else a dealer can do other than

to use normal good industry practices when building out the RF infrastructure as far as transmitters, receivers and combiners are concerned," the first dealer said.

A second dealer disagreed, at least partially.

"Since our PassPort system began three years ago, Kenwood has been the single most successful product line that we've had. Every time we talk about radios that work, that don't work or that have remaining problems—and they all do—the Kenwood radio has worked better than anything else that we've held in our hand and worked with," the second dealer said.

He said that to help with its remaining problems, Kenwood had engaged a software company that had had some success with the PassPort protocol.

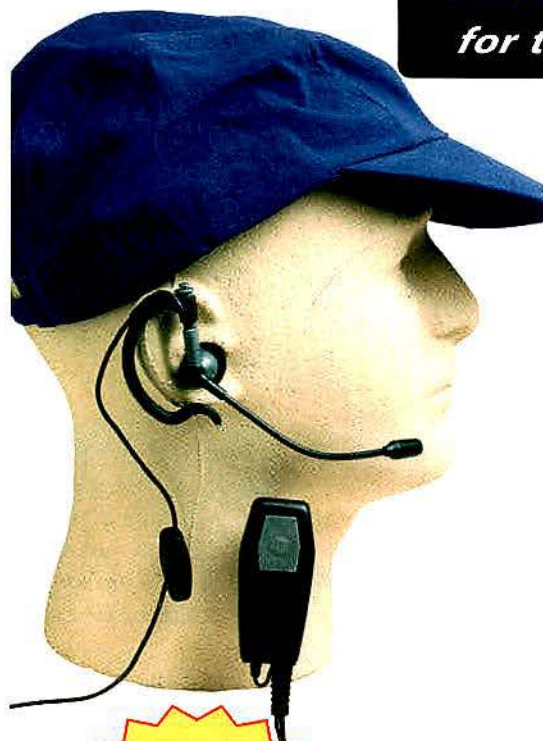
"But we are open and eager to embrace any manufacturer that puts out a subscriber unit that works as it should, and that includes Icom, Vertex Standard and Ritron. Our experience with Motorola has been minimal. Motorola has not shown a strong interest in working with us because we're the 'other half,' a non-Motorola dealer. But I hear that their unit works well," he said.

The PassPort system is a relatively complicated network, the second dealer said of the infrastructure. "It isn't something you construct, bolt and play. You have to have smart people to configure your system and keep it operating. We have helped many dealers work out their problems, and it has been a pure lack of knowledge on their part. Something that took them weeks, we fixed in hours. PassPort is not for the faint of heart. You have to have savvy people."

'Home alone' OK but not ideal

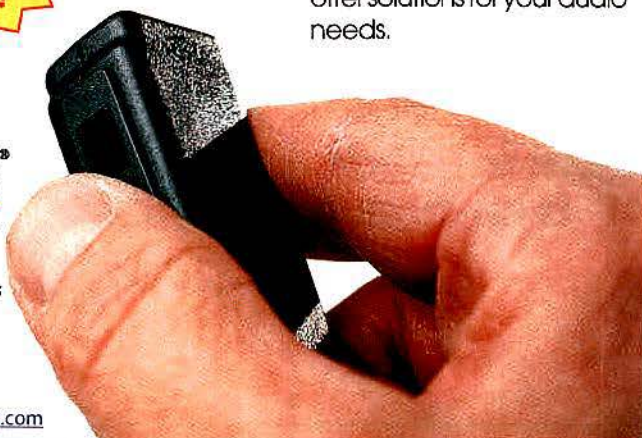
To operate PassPort requires at least one exclusive (non-shared) channel per site for the system's "home" channel. A subscriber unit's transition from one networked site to another works when it has to register on the next site's home channel, but registration is

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faster when each site has a second exclusive channel called the "collect" channel.

"If you don't have a collect channel and the home channel is busy, the unit can't register until the home channel is free. A mobile could wait a long time before it registers and is available for use" with-

out a collect channel, the first dealer said. "Having multiple exclusive channels would be ideal."

Some dealers are awaiting licenses for exclusive channels obtained with successful bids in FCC Auction No. 40 last September. Our first dealer bought a number of channels; the second missed the

auction and regrets it; and a third bought a large quantity of channels for "a surprisingly low price."

'Strongest signal' selection

The second dealer said that it would be an advantage on his system to have a subscriber unit with the ability to select a site with the strongest signal when it de-registers from one site and re-registers with another.

"Strongest signal selection cuts the downtime of the radio as it toggles back and forth from an improper site selection. Yet, it takes more time to make the registration. But it's better to extend the selection time than to have to go through the selection process again and again," he said.

The dealer said he had found that Icom's PassPort subscriber unit with strongest signal selection works well. But with his brand preference well established, he said that he is pleased that Kenwood is about to add the strongest-signal feature to its subscriber units.

A system engineer offered the opinion that, with a network of towers with a lot of overlap, strongest-signal selection offers "a little more precise way to engage a site."

"We are optimistic," the second dealer said. "We always have been optimistic about PassPort. The current level of performance has been a long time coming. We hoped for a quicker resolution to some of the problems that plagued us for years, particularly in subscriber units."

"We looked at all the network systems. Most were analog, without a digital migration path. PassPort and its accompanying repeater controller are digital, so they'll work with possible future digital subscriber units and repeaters," he said.

For the dealer, networking was a must, although PassPort allows him flexibility in keeping some customers on LTR and some PassPort users with single sites or a restricted list. The dealer added that he knew his company couldn't survive in the two-way radio business with single-site systems. ■

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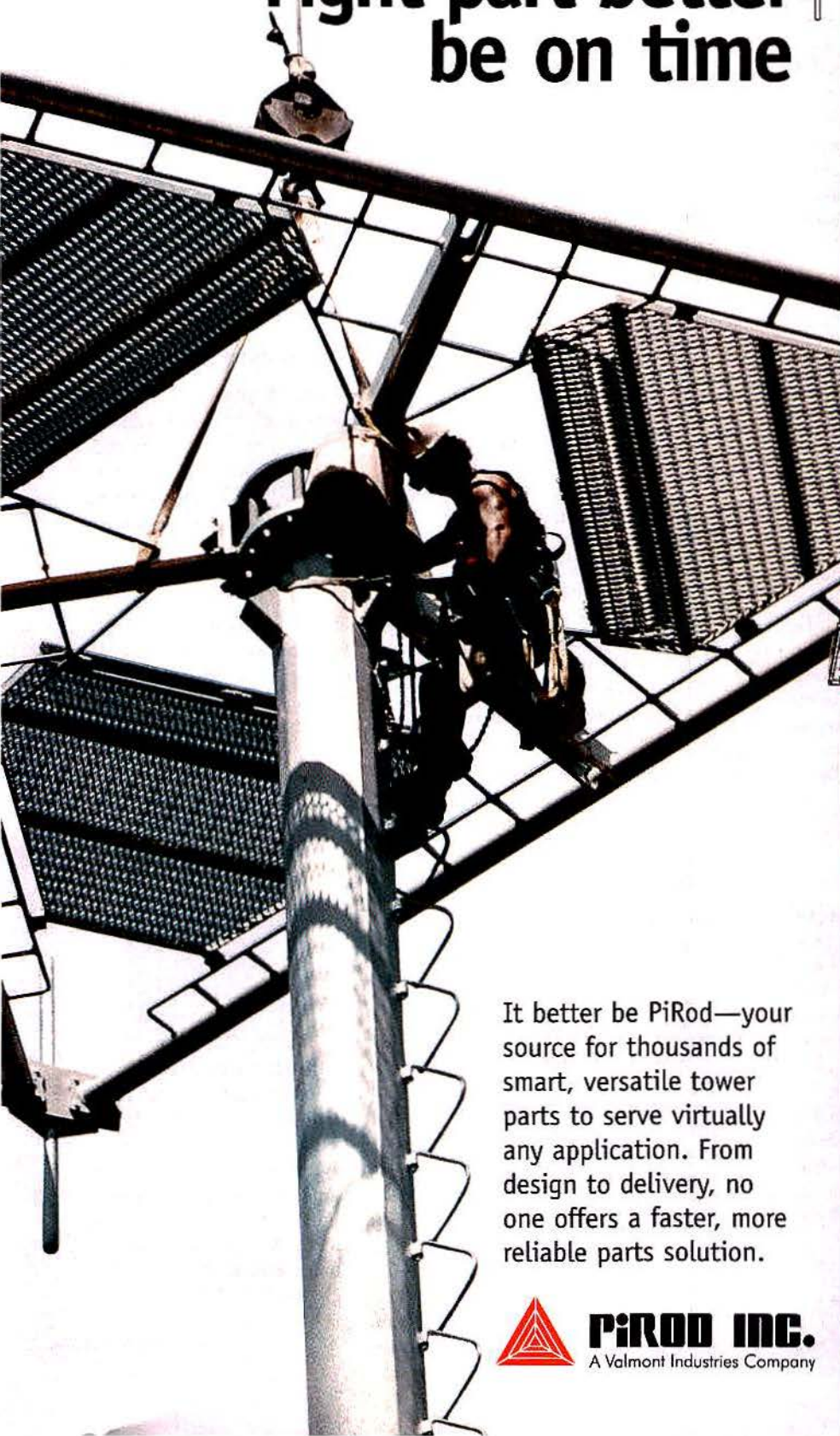
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CIRCLE (19) ON FAST FACT CARD

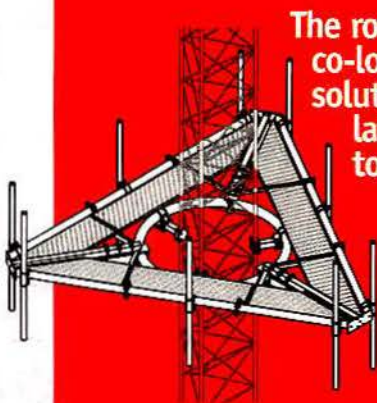
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Base station controller



Avtec's base station controller is a microprocessor-based remote radio controller capable of providing voice communications and radio control from a central dispatch office. Owner-configurable parameters allow the BSC to be deployed in many operational environments.

WWW.AVTECINC.COM

Receiver system



The Coyote from **Berkeley Varitronics Systems** features hot-swappable components allowing for versatile field use, including removable, independent receiver modules, GPS receiver, rechargeable Li-ion battery and compact ATA flash.

WWW.BVSYSTEMS.COM

Battery analyzer



The **Cadex 7400** programmable battery analyzer and charger features Quicktest to test a battery's state-of-health in three minutes. The 7400 supports more than 700 custom-built battery adapters and offers 16 service programs.

WWW.CADEX.COM

Digital radio headset



The digital CT-DECT headset from **CeoTronics** offers speech and parallel data transmission for as many as three users per talk group and is license free. The module integrates into all CeoTronics communications systems.

WWW.CEOTRONICSUSA.COM

Crystal filters



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- ☐ GE Master II, Master Exec II and MVP
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WWW.COM-SPEC.COM

Termination panels



The MR series dc and tone termination panels from **CPI Communications** interface to most Motorola mobile radios and provide a "plug-in" product for remote control connection.

The panel is housed in a vinyl-clad aluminum case and includes all necessary cables for connection.

WWW.CPICOMM.COM

Radio repeater



The **Daniels Electronics** transportable radio repeater and satellite link allows two-way radio users in remote areas to access the phone network through a satellite.

It also can function as a local repeater.

WWW.DANELEC.COM

P25 radios



The Guardian portable, mobile and trunk radios offer the Project 25 FDMA common-air interface for complete interoperability in radio service pools incorporating the P25 standard.

It is also fully backward-compatible with conventional wideband FM systems.

WWW.DTWC.COM

Speaker microphones



David Levy Company carries a variety of hand-held, earphone and mini-boom speaker microphones for two-way applications. These microphones are suitable replacements for Standard, Icom, Yaesu, Kenwood, Motorola, Uniden and all FRS systems.

WWW.DLCPARTS.COM

Tone remote



The **IDA** model 24-30 tone remote has many features and is aesthetically pleasing. It is also dependable and joins an extensive family of remotes and panels.

WWW.IDACO.COM

Battery charger

iTECH's (Intelligent Technologies) iQpac offers three charge rates, pulse conditioning charge, constant current charge, a data port that connects to a PC for battery performance tracking and a LCD to display battery capacity.



WWW.ITECHENG.COM

VoIP products



JPS Communications manufactures voice-over-IP products optimized for remote radio applications, crossband interfaces that interconnect multiple radio bands and receiver comparators that vote analog and trunking signals.

WWW.JPS.COM

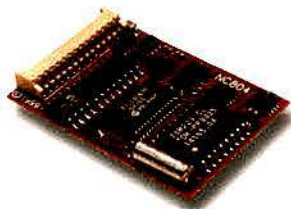
Self-contained radio site



The OpenSky self-contained radio site from **M/A-Com** contains trunking base station radios and other network routing and RF equipment to provide cellular coverage. The equipment is housed in an aluminum shelter with air conditioning.

WWW.MACOM.COM

Encryption scrambler



The model NC804 from **Norcomm** is a microminiature voice plus rolling code encryption scrambler designed to provide high-level security for two-way radio voice communications systems.

WWW.NORCOMM CORP.COM

Multiple amplifier series



The MAS (multiple amplifier series) from **TPL Communications** is designed for system integrators. It is designed to house as many as five 100W vertical slide-in amplifiers in a 19-inch rack, using only seven inches of vertical rack space.

WWW.TPLCOM.COM

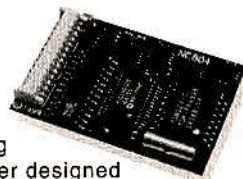
VOICE Plus ENCRIPTION SCRAMBLER

MODEL NC804

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(1-9 pcs.)

The Model NC804 is a micro-miniature voice-plus pseudo-random rolling code scrambler designed to provide high level security for two-way radio voice communication systems. It's unique digital encryption processing algorithm, plus it's many features makes the Model NC804 a perfect cost effective solution for high-end voice encryption scrambling for commercial users, police departments, public safety organizations and other systems as a defense against unauthorized interception of private and sensitive voice transmissions by casual or even the most determined listeners. The Model NC804 features 8 user code keys with over 20 trillion codes to choose from. Kill disable for stolen or lost radios, over the air programming for changing of units operating parameters without removal from radio. Measuring .90" W x 1.30"L x .22"H, the Model NC804 supports limited space applications and is plug compatible with our popular Model NC802 voice inversion scrambler making it ideal for system upgrades.



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City picks M/A-Com for compatibility

When fighting a major blaze, the last thing an emergency response agency wants to deal with is "putting out fires" in their communications networks. To keep up with growing populations and heightened anxieties caused by events such as the Sept. 11 terrorist attacks and the 1999 shootings at Columbine High School, agencies across the country are re-evaluating their communications networks.

Aurora, CO, for example, is in final contract negotiations with M/A-Com for a new radio communications network that will migrate and evolve with the growing needs of the city. The city, which currently uses a Motorola system, is switching to a M/A-Com enhanced digital access communications system (EDACS).

The biggest reason for the system switch is the fact that adjacent Denver works on the M/A-Com system, said Aurora Fire Communications Captain Kent D. Patton. Denver has used the system since 1989.

Once the Aurora EDACS system comes online, M/A-Com systems will cover 65% of the population in the state of Colorado, said David Cerqua, M/A-Com's area sales director. Other local areas currently working on the EDACS system include the Denver Water Board; metropolitan-area cities of Westminster, Arvada and Lakewood; West Metro Fire Protection District, Rocky Flats Environmental Technology Site; Continental Airlines and Denver International Airport (DIA).

"Denver being on the system was a driver because we like to talk with

them on a daily basis," Patton said. "M/A-Com offered a unique package with the towers we were looking for, it had a nice service package, and we had heard good things about it from Denver. The Star Gate switch was also intriguing, and the ability to talk is important."

M/A-Com's Star Gate switch will work ultimately to tie all EDACS systems in the region together, providing interoperability for all area agencies. "The Star Gate controller hooks multiple integrated multisite controllers together," Cerqua said. "It will allow the people in Aurora to connect the systems that are currently in place in Denver, Westminster, Arvada, Lakewood and DIA ... which would create a

Continued on next page



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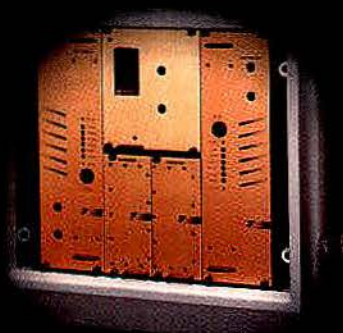
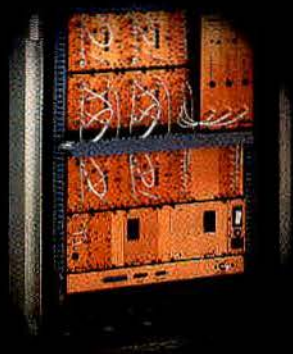
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virtually seamless Denver metropolitan area system."

Coverage was Aurora's first concern when choosing a new communications system. The city's RFP called for 95% portable, on-the-street coverage. M/A-Com is meeting this requirement with three new tower sites. Another of Aurora's major requirements was in-building penetration. The EDACS system was able to penetrate deep into Aurora's buildings, Patton said.

"Building penetration is good through masonry walls and steel structures," he said. "We were looking at firefighter and police safety. We know they aren't safe if they can't communicate."

Aurora's second concern was price. Originally, the city only wanted a public safety system. However, M/A-Com was able to pro-

vide a system that would also include public works. "With EDACS, they don't have to try to maintain two infrastructures," Cerqua said.

"On the older infrastructure, some of the parts are becoming obsolete, so (Aurora) would have had to replace it in a few years anyway. We were able to bring the entire city under one system, which is going to be very cost-effective for them in the long run," Cerqua said.

The EDACS system is designed to provide both forward and backward compatibility, and is designed for future growth upgrade ability and expansion.

Aurora's new system is slated for implementation by October 2003. "The emphasis is on better communications for fire and public safety," Patton said. "And the city has taken a very responsive role in that."

—MA

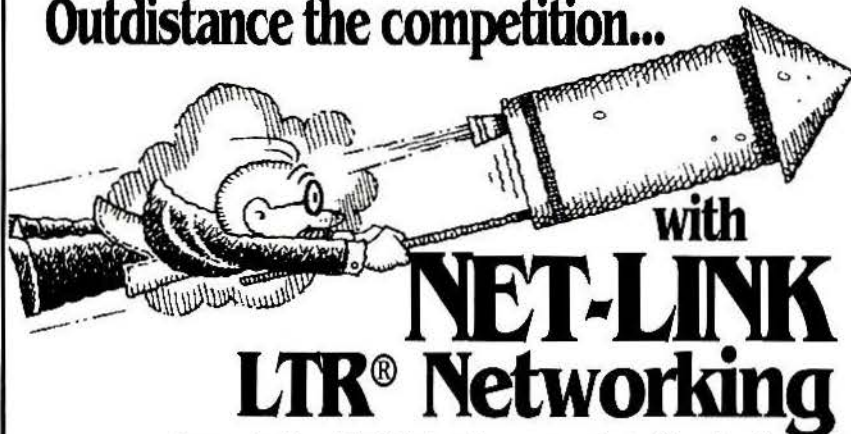
Transcript changes name to EFJ

Transcript International, Lincoln, NE, changed its name on June 13 to EFJ. The change reflects the identity of EFJ's land mobile radio equipment manufacturing subsidiary, E. F. Johnson Company.

On June 17, shares of EFJ began trading on the OTC Bulletin Board under the symbol EFJI. The name change required no re-issue of outstanding stock certificates. E. F. Johnson does about 80% of EFJ's business. The other portion of EFJ's business provides communications encryption products and services. Formerly known as the Secure Technologies Division, that part of the business now will take the Transcript International name.

—DB

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SS-10	7	10	1 1/4 x 6 x 9	3.2
SS-12	10	12	1 1/4 x 6 x 9	3.4
SS-18	15	18	1 1/4 x 6 x 9	3.6
SS-25	20	25	2 1/4 x 7 x 9 1/2	4.2
SS-30	25	30	3 1/4 x 7 x 9 1/2	5.0

DESKTOP SWITCHING POWER SUPPLIES WITH VOLT AND AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-25M*	20	25	2 1/4 x 7 x 9 1/2	4.2
SS-30M*	25	30	3 1/4 x 7 x 9 1/2	5.0

RACKMOUNT SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-10	7	10	3 1/2 x 19 x 9 1/2	4.3
SRM-12	10	12	3 1/2 x 19 x 9 1/2	4.7
SRM-18	15	18	3 1/2 x 19 x 9 1/2	5.0
SRM-25	20	25	3 1/2 x 19 x 9 1/2	6.5
SRM-30	25	30	3 1/2 x 19 x 9 1/2	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M	20	25	3 1/2 x 19 x 9 1/2	6.5
SRM-30M	25	30	3 1/2 x 19 x 9 1/2	7.0

2 ea SWITCHING POWER SUPPLIES ON ONE RACK PANEL

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25-2	20	25	3 1/2 x 19 x 9 1/2	10.5
SRM-30-2	25	30	3 1/2 x 19 x 9 1/2	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M-2	20	25	3 1/2 x 19 x 9 1/2	10.5
SRM-30M-2	25	30	3 1/2 x 19 x 9 1/2	11.0



MODEL SRM-30M-2



MODEL SS-12SM/GTX



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SS-10MG, SS-12MG
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Government delays 700MHz auction

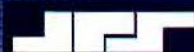
Auctions of wireless communications licenses for radio spectrum now allocated for TV broadcasting will be delayed as a result of President George W. Bush's having signed federal legislation on June 19.

"The President signed into law H.R. 4560, which prohibits the Federal Communications Commission from conducting the auctions of licenses for spectrum scheduled for Wednesday, June 19, 2002," said Ari Fleisher, the president's press secretary.

The FCC had been under a statutory deadline to deliver the proceeds from the auctions to the U.S. Treasury by the end of the federal government's fiscal year on Sept. 30. The new law removes the deadlines. The FCC now is required to report to Congress when the auctions will take place within a year. The law also directs the commission to report progress in the transition to digital television.

The auctions and the transition are related. Broadcast stations using UHF-TV channels 60-69 are not required to vacate and make room for the proposed commercial wireless operations and for public safety radio communications systems until the end of 2005 or until 85% of TV households in a given market have digital television, whichever is later. Similar conditions apply to TV stations on channels 52-59.

The new law allows a small portion of the target spectrum to be sold later this summer for use in rural areas. —DB



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CIRCLE (28) ON FAST FACT CARD

20 years of progress: Solid-state electronics

As our magazine celebrates its 20th year, Art McDole takes a look at progress in electronics and radio.

My interest in electronics started in the 1930s when I heard a radio broadcast from Denver, nearly 100 miles from my home in the mountains. I used a radio with banks of batteries and four vacuum tubes. Following World War II, I became an amateur radio operator in a time when all radio equipment had vacuum tubes.

The first solid-state device I remember was a 1N34 diode about the size of a pencil eraser.

In 1949, I became a sergeant in the Monterey County (CA) Sheriff's Office. My job was to maintain the radio system, including a 1kW base transmitter on 1,674kHz (kc/s in those days) and talk-back mobile AM transmitters on 35.220MHz (Mc/s). These current-hungry vacuum-tube units were built on-site. When a deputy depressed his push-to-talk switch, the dynamotor hummed and the vehicle lights dimmed.

At this time, we were transitioning to a "modern" VHF FM system, also with vacuum tubes. In the early 1950s, we obtained several lunchbox-sized "portable" radios with many batteries and "peanut tubes."

The first all-solid-state radio I remember was the Motorola HT 200, fondly referred to as "the brick."

I saw an early computer in the 1940s at the Naval Postgraduate School in Monterey. Envision a huge, refrigerated room filled with equipment banks with hundreds of vacuum tubes.

I remain in awe of solid-state progress from massive transistors to microchips. Public safety communications equipment includes impressive miniaturization, reduced power consumption and performance. The millions of cellphones on extensive networks seem like works of science fiction.

None of this could have happened without solid-state electronics and the exponential development of computer science.

As electronic devices become smaller and more complex with higher operating speeds, we should remember that we owe a debt of gratitude to the engineers who developed and who continue to find means to further this incredible world of solid state.

—Art McDole, Salinas, CA

McDole is an original member of our editorial advisory board. After 41 years with Monterey County, he retired as communications director in 1990. A life member of APCO, he is co-chairman of APCO's Project 25 Steering Committee and APCO's frequency adviser for Northern California.

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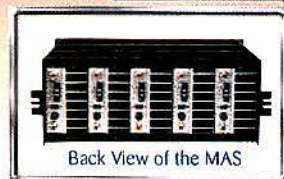
WWW.SWATHEADSETS.COM

MAS

Multiple Amplifier Series



Single slide-in Amplifier



Back View of the MAS

The MAS RF Power Amplifier package is designed for system integrators. It is designed to house from two to five 100 Watt vertical slide-in amplifiers in a 19" horizontal rack, while using only 7" of vertical rack space. This packaging system accepts any TPL amplifier from VHF through 960 MHz with output levels up to 100 Watts.

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indicators for DC and RF Power, and two cooling fans.

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COMMUNICATIONS

CIRCLE (30) ON FAST FACT CARD

Headset features surround sound



The **Peltor Swat-tac** headset combines current electronics technology and hearing protection for communications applications requiring the use of riot or ballistic helmets. The headset features slim-line earcups, covert black color with no shiny parts, a flexible gooseneck microphone, palm or finger radio PTT-activated patchcords for use on existing or new two-way radios, and Peltor's surround-sound technology. The two microphones on the outside of the cups allow the user omnidirectional hearing at all times.

WWW.SWAT-TACOFFER.COM

System offers full duplex communications

The CT-DECT communications system from **CeoTronics** provides the functionality of cable-bound communication on a wireless digital platform. Multiple people can now simultaneously speak and listen (full duplex). The system uses DECT (digital enhanced cordless telecommunications) standard, so every word is automatically encrypted. The system is structured in groups of three: one base head-

set and two mobile units. The number of participants and the radius can be increased by including more base headsets. The whole system automatically configures itself after a new participant has joined and automatically searches for the right channel.

WWW.CEOTRONICSUSA.COM



Bone-mic headset suits full-time SWAT teams

The Invisio bone-mic headset from **Television Equipment Associates** is available either as a generic (one size fits all) version, or it can be built into your custom earmold. While most tactical users

select the generic version, full-time SWAT teams have selected this headset because they expect to wear the bone mic 40 to 50 hours per week.

WWW.SWATHEADSETS.COM

Make your batteries last twice as long

The **Cadex 7000 Series Battery Analyzer** restores weak batteries through a proprietary reconditioning program. Unserviceable packs are identified and weeded out. The **Cadex QuickTest™** allows you to check battery state-of-health in 3 minutes. Operation is simple; **SnapLock Battery Adapters** accommodate all major batteries with minimal adjustments. You can generate battery labels, service reports and interface to a PC to store detailed test data.

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The CPI line of Multi-Channel remotes includes systems for the Kenwood -80 and -90 series as well as Motorola's CDM1550(LS) and M1225 Series. CPI's new TTP216 tone termination panel is now available and the TR810 console and TR Multi-freq remotes will be available in the next several months.

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CIRCLE (32) ON FAST FACT CARD

Products

Product Encore

Base station uses space efficiently



The 2601 series digital repeater/base station from **EF Johnson** offers dual-mode operation and meets the requirements of Project 25 digital operation and TIA 603 analog operation. A five-channel repeater, combiner, duplexer and multicoupler can fit in one eight-foot standard rack.

WWW.EFJOHNSON.COM

ANI desktop decoder uses DSP technology

Cimarron Technologies'

C Plus is an automatic numerical identification desktop decoder. The decoders incorporate DSP processing technology, which can enhance performance in areas with weak and distorted signals. They are user-programmable for MDC-1200, GE-STAR or FleetSync formats. The units will include two-way MDC-1200 and GE-STAR capability, a 4,000-ID database for its 27-character alphanumeric display, AGC for hassle-free installation and serial, IR and USB interface. The decoders incorporate Flash programming technology to allow upgrades and custom features to be added in the field. The C Plus will be available in a computer/console interface model, single window display model, multiwindow display model and a multichannel model.



WWW.CIMTECHCORP.COM

Pagers, parts, and more



Motorola Keynote pagers:

- ☒ \$99 Monitor Only
- ☒ \$120 2-tone page only
- ☒ \$170 2-tone page & Monitor
- ☒ On freq with 90 day warranty

Monitor board

- ☒ Installed in a Keynote \$50
- ☒ Installed in a Director II \$60
- ☒ Board only \$40 each (Min 10 boards)

Minitor II scan board

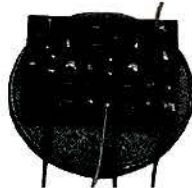
- ☒ Installed \$50 each
- ☒ Do it yourself kit \$40 each

Minitor III pagers \$299

- ☒ Add \$40 for Stored Voice
- ☒ Add \$60 for 2 channel
- ☒ Add \$38 for 5 year warranty
- ☒ Add \$99 for amp charger (in place of std)
- ☒ These are brand new units
- ☒ One year factory warranty

**Authorized Dealer pricing shown
others slightly higher**

Motorola, Minitor, Director & Keynote are reg. trademark of Motorola Inc.



Tone filters/reeds

- ☒ Minitor I \$20 each
- ☒ Minitor II \$25 each
- ☒ In stock reeds/filters only

Programmer interface \$115

- ☒ Replaces Motorola #NLN3548B

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CIRCLE (33) ON FAST FACT CARD

Mapping software enhanced

Version 2.0 of Street Smarts Mapping Software produced by **Pyramid Communications** is a street-level mapping program to be used in conjunction with the company's Merlin AVL fleet tracker. Version 2.0 enhancements include geofencing, which gives the dispatcher the ability to be automatically alerted when a vehicle arrives or leaves a pre-defined area. It also includes an over-the-air speed limit alert with improved reporting capabilities.



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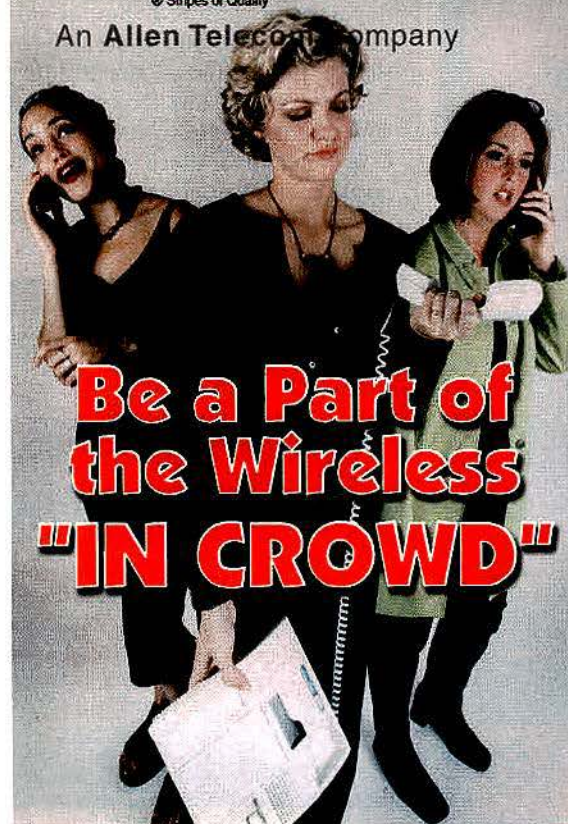


CIRCLE (22) ON FAST FACT CARD



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Products

Boxes offer 200A power protection

The Pop Box model AA1220061 from **Intersect** is for power outage protection. The box integrates a transfer switch, load center and surge protection into a sleek configuration. The panel is designed for 200A, 120/240 single-phase (three-wire) applications. The unit deploys an ASCO-manufactured transfer switch that connects to primary and secondary electrical supplies and automatically switches between the connections based on the active feed source. The transfer switch is UL 1008-listed.

WWW.INTERSECTINC.BIZ



Correction

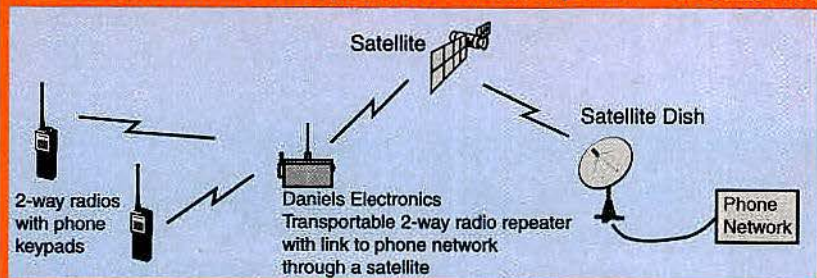
In the May 2002 issue of *Mobile Radio Technology*, the "Products" department featured the surveillance rack antenna system from Sti-Co Industries as the Product Encore. Sti-Co has discontinued that product. Please refer to Sti-Co's Web site for more information on its current products.

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CIRCLE (38) ON FAST FACT CARD

Charger keeps batteries at peak

Advance-Tec's negative pulse reconditioning charger/Pulse analyzer functions as a rapid negative pulse reconditioning charger, and with the push of a button, becomes a Pulse analyzer conditioner. The unit charges and reconditions two-way radio batteries daily, keeping the battery at peak condition, extending the life of the battery by as much as three times. When functioning as a negative pulse reconditioning charger, it uses inflection point cut-off as its primary termination method, terminating the charge as soon as the battery reaches capacity.

WWW.ADVANCETEC.COM



Interface extends control over IP

JPS Communications' ETS-1 network interface is for the ACU-1000 wide-area interoperability systems. It extends control, voice and data of JPS' interoperability products over Internet protocol networks. This ethernet-to serial interface gives the ACU-1000 an IP address so it can be controlled over a digital network. A voice channel in the interface using VoIP allows remote audio interface to the

interoperability system via the network. The interface uses a high-speed digital signal processing and a network processor to multiplex audio and control information over a single Ethernet connection. With connective equipment, the unit will link to LAN, WAN or the Internet.

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10 ea.	MITREX, 155 MHz, T81JA4000
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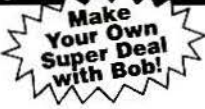
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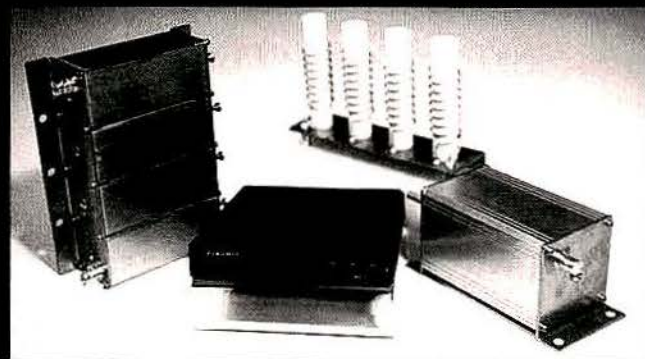


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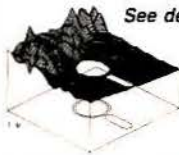
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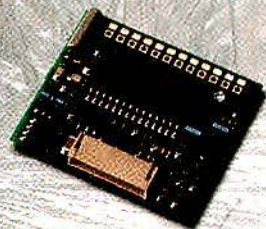
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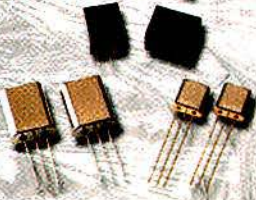
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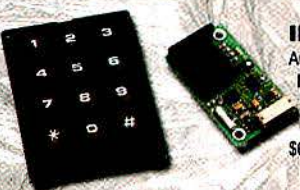
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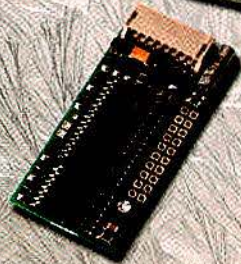
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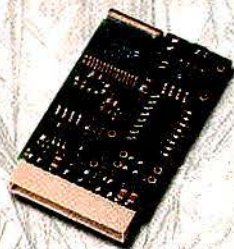
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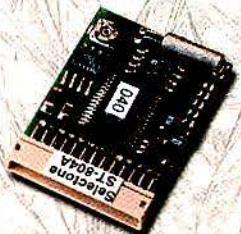
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